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INFORMATION REPORT INFORMATION REPORT

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WORK ON ISLAND IN LAST PHASES BEFORE DEPARTURE OF GERMAN ROCKET GROUP

Ballistics group

6. Work was done on the trajectory of an A.A. rocket, the R–113.

graphical methods of solving trajectory problems quickly. Three trajectories were studied in turn. The work was allocated by WOLFF and he did not know who, among the Russians, was interested.

7. QUESSEL designed a special quick-acting electro-magnetic clutch and FALKENMAYER, working on it in the workshops, made up a clutch using laminated metal sheets which were bonded together with a very strong adhesive (the laminated assembly could be machined without clamping the sheets together).

Aerodynamics group

8. CONRAD worked on a mathematical method for establishing flow régimes of high Mach number through nozzles. it might be in connection with the design of working sections for wind tunnels. The method was partly graphical, partly numerical and, when asked whether it was for the two dimensional or three dimensional case, it was for the two dimensional.

Electronics group

9. the electronics laboratory was under PREIKSCHAT's leadership. an eight-channel oscillograph which was originally designed by MOLLWO. As designed, the instrument was intended for use with the ground receiver array previously described It could employ the Philips L.B. 8 valve and also a normal type of German-made high speed C.R.T. Quantities of the latter were available in Russia in the form of war booty. the basis of the original layout but modified the design to make it capable of a more general application, re-designing amplifiers, using new capacitor and resistor values, &c. one set was completed and a second was about three-quarters completed.

10. PREIKSCHAT, built an apparatus to determine characteristics of antennæ; he knew the Russians built a similar device because after PREIKSCHAT left the Island a Russian visited the Island from NII. 88 and said that they already had developed a better solution to the problem. The Russians asked UMPFENBACH, (who was, head of the German group) to have PREIKSCHAT's design re-worked. The equipment was portable and was made to fit on the top of a tower to take all forms of antennæ up to a maximum wave length of the order of 50 cm. It could rotate at 20 cycles per minute. The equipment consisted of a receiver including detector, amplifier, and modulator, of frequencies about 1,000 cycles per second. Only the top 1 to 1½ metres of the tower was constructed, including the rotating platform.

11. SCHMIDT worked on a standing wave measuring instrument for use in waveguide work.
The same engineer also worked on a combined binary counting and frequency measuring instrument. Using this it was intended that an unknown frequency of the order of a few hundred Kcs. could be divided in step with a second standard frequency; when the successive division of frequencies had produced two suitable sub-frequencies, the two sub-frequencies could be compared, using the Lissajous figure principle.

12. [redacted] worked on the development of an electronic calculating machine for the determination of optical paths; this work was done at the request of a uniformed Russian officer [redacted] This officer was from an institute in Leningrad. The work was not classified, and accounts of similar work are to be found in available open literature on the subject. A vector method was employed for calculating the optical path through multiple surfaces. CONRAD did the mathematical work involved, [redacted] When the Germans left, the Russians requested all details (although the officer did not appear to be interested in their methods). All material involved was handed over to the Russians. [redacted]

Design Group

13. This group worked on the design of outboard motors during the last phase of the stay on the Island.

Other Work

14. [redacted] UMPFENBACH in the development of the special altimeter [redacted]

15. MAGNUS's work on a course-setting gyroscope has previously been referred to. [redacted]

16. The Russians DRANOVSKI and KRASNUSHKIN [redacted] worked on the small test stand in 1952, when the Germans were no longer working on it. [redacted]

17. It was previously reported that NEIDHARDT had worked on an improved telemetery (MESSINA " N ") [redacted]

ZEISS Group

19. This group worked on an electromagnetic stabilization device for power packs of the order of 10 Kw. output. They also did some work on ultra-sonic generators of large power; this work was theoretical and the Germans were unable to discover from the Russians in what media the ultra-sonic emission was to be propagated; the " magneto-striction " principle was employed. The German KORTUM, [redacted] was working on this device. An ultra-sonic filter, which he claimed to have developed himself, was subsequently found to have been based on the description of a similar item which appeared in a U.S.A. magazine.

20. Another task given to the group in this period was the construction of an astronomical reflecting telescope using a 2½-meter diameter mirror. This work was carried out by Dr. KUHNE (?) of Zeiss and PFAFF, now in Jena. They also worked on an automatic device for control of this telescope to follow a star, thus permitting photographs to be taken over a long period of time.

Other Information

21. *Security.*—Secret papers, including the Germans' own working papers, were kept in sealed portfolios and had to be taken out from security store and returned each half-day—morning and afternoon. Papers had to be listed and this was sometimes checked. Papers could not be taken out of the institute. 25X1

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22. *Transfer of Equipment.*— the water channel was sent from the Island in 1951 before ALBRING left and he was told it went to Moscow. No men were transferred. Later in 1952 the wind tunnel was sent away, also to Moscow; SKRIPNICHENKO was transferred away soon after the wind tunnel had gone. 25X1

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23. *Influx of Personnel.*—The members of the Russian group which came to the Island in 1951 to familiarise themselves with the work, with a view to taking over, were almost all young engineers apparently straight from Technical School.

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GUIDED WEAPON PROJECTS

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Nomenclature

24. designations given to various projects. 25X1 25X1 the numbers R–1 to R–9 might be Russian designations for German rocket projects. G–1 was the original designation 25X1 of the R–10 the various modifications to the whole R–10 project (as it was later designated) were at first known as G–1 (*a*), G–1 (*b*), G–1 (*c*), G–1 (*n*), G–1 (*o*). G–1 (*o*) was the highest suffix designation used. 25X1 G–2 25X1 was in fact the project later known as R–12 or an earlier project. 25X1 the G–4 was the project later known as R–14. 25X1

R–10 Project

25. *Experimental Programme.*— the experimental work carried out or projected for the R–10 development. 25X1 25X1

(*a*) *Ballistics of the Warhead.* 25X1

Four types of warhead were designed for experiments with the A–4 rocket. They were to be separable and space was allowed for the carriage in the warhead of telemetering equipment and measuring instruments. The experimental firings were intended to provide data on separation and behaviour of the warhead after fuel cut off, on stability and acceleration, and on heating at re-entry. One or more of the heads was to be of wood or to have a wooden liner, the intention being to measure the amount of burning which took place in the terminal part of the trajectory.

Some waterchannel experiments were carried out in order to obtain aerodynamic data on the separation of warheads as a general problem.

(*b*) *Constructional Investigations.* 25X1 25X1

(i) Some motors were got ready at NII. 88 for static tests which were done on the Island. These were of the original A–4 type. The tests were intended to be part of the constructional proving programme.

(ii) A series of tests were drawn up to prove the whole rocket body. A typical item in this series was the test intended to obtain data on pre-launch cooling. Full-scale models of parts of the rocket were also made at NII. 88.

(iii) A series of firing tests were proposed. These were to be carried out using the R–10 design of body but with an A–4 motor modified (shortened and with increased fuel flow) to suit the R–10 requirements. The motor was to give 32 ton (32000 Kg) thrust but a separate gas generator was to be used (*i.e.*, no gas bleed from combustion chamber to turbines). There was to be no change in the cooling arrangements.

(iv) A programme of tests was proposed for such items as handling, fueling, loading, on trucks, &c. A modified form of transporter was proposed. 25X1

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Further Information

26.—(*a*) the temperature of the cooled exhaust gases was about 1000°K or 700°C This temperature was determined by the limitations of the aluminium (alloy) blades of the A–4 turbine. It was suggested that the figure should be nearer 500° C.

(*b*) The original warhead design for the R–10 allowed for wooden construction. The later alternative design of a steel head was made at the request of the Russians.

(*c*) Russian criticisms at the first (1947) R–10 conference were confined to the general comment that calculations were in insufficient detail. This applied chiefly to the question of structural design and stability. The single major change in the design between the 1947 and 1948 conferences was the provision made for building the mixing unit into the missile. Originally, it had been intended that this unit should be in the ground equipment. The later decision was taken after further thought by the control specialists, led by HOCH.

(*d*) The R–10 motor was to have a thrust of 32,000 Kg.

(*e*) While the design range of the R–10 was 910 Km., various engineering imperfections, chiefly of a structural nature such as might arise in production, could reduce this figure to about 850 Km. minimum. Consideration had been given to the possibility of firing the R–10 at ranges less than the nominal but there were difficulties in the way of doing this

(*f*) The stated accuracy of 1 in 1000 of range was a design figure. there would be a 25% fall of shot in an approximate square of ·91 Km. side, the square being the common intercept between the 50% zone in range and the 50% zone in azimuth.

the re-entry effect had been considered but not calculated, in arriving at the estimate of accuracy. this effect would only be of the order of 200 to 300 metres.

R–12 Project.

27. The R–12 project for a two or more stage rocket was chiefly carried out by ALBRING, aided by KLOSE of UMPFENBACH's group. BERTHOLD was also engaged on this work. two types of schemes.

(*a*) Schemes in which the two stages used conventional rockets, the complete tanks and motors of the first stage being jettisoned at end of the stage and

(*b*) A method in which the motor of the second stage was to be put inside a tank of the first stage. At the end of the first stage the tank was to be blown off leaving the second stage motor free to operate.

There was no apparent Russian reaction either way to the proposals on multistage rocket projects. Work on the projects was stopped voluntarily in order to proceed with the R–14 study, the Russians would have accepted any study with little or no comment, whether for a single or multistage project.

R–14 Project

29. The decision to proceed with the R–14 and R–15 proposals in preference to the other AVANT proposals Although it was nominally a ratification by Moscow of KURGANOV's recommendation

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KURGANOV obtained Moscow (presumably as represented by Director of NII. 88) approval, and then called a meeting 25X1

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Russians were not working on the R–14. Even if they had accepted the reports and said nothing at all, it would have been no sure indication of lack of interest. In fact, one or two queries were put to the Germans after completion of the R–14 study. The tasks specifically requested by the Russians included the work on rail and road transport of the R–14 (instead of the German proposal for an underground factory and associated launching site) and the alternative construction in dural in place of steel, 25X1

30. *Construction.*—the exact all up weight of the 25X1
rocket the thrust to weight ratio was 1·4. For a thrust 25X1
of 100 (metric) tons therefore, this would give an all up weight of 70,000 to
72,000 Kg., this was the method 25X1
The parallel study of a light alloy construction instead of a steel one. was made at
the request of the Russians. 25X1
possibly supplies of the high grade steel originally called for 25X1
may not have been readily available for this work. This was probably the only
request which was received after completion of the R–14 study 25X1
25X1

the end of the body cone (the skirt) did not extend to 25X1
or beyond the nozzle exit plane. it did not and that the final design decided 25X1
upon after further study of the relative positions of the C.G. and C.P., 25X1
an earlier proposal did provide for 25X1
a lengthened skirt and thereupon described the version previously given by PREIKSCHAT. In one version, the extended portion was arranged so as to be jettisoned. The skirt was to have been of corrugated section. In view of the large diameter of the skirt it was proposed to make this in two parts and remove it for transport.

31. *Warhead.*—There were two warheads proposals. That proposed by the Germans was to be of wood. but the Russians asked for a design in steel

25X1

the designs called for a wall thickness of 40 mm. for the 25X1
wooden warhead and for 20 mm. plus some insulating liner in the case of the steel warhead. Both were cylindrical and separable, and on separation, the front fairing cone was to be blown off in both cases. The weight of explosive was to be adjusted so that the total weight of head would be the same in the two cases. Since, for the form of warhead proposed, the velocity at impact would be only a few hundred metres per second, the question of a kinetic energy contribution does not arise.
at one time ALBRING had considered designing a 25X1
warhead which would provide for a laminar flow so as to increase speed. (It is not clear whether this was for the R–10 or the R–14.) The possibility of cooling the warhead by means of water or other liquid was also considered, but no work was done on this.

32. *Propulsion.*—the proposed arrangement of 25X1
the R–14 motor (Fig. 9). 25X1
the motor size was about the same as for the A–4. thrust 25X1
was transmitted to the missile frame through a double knife edge, as shown. 25X1
a ball and socket arrangement was contemplated but was not adopted because 25X1
of the friction problem. a gymbal (" CARDAN ") suspension was 25X1
also considered and rejected because of the excessive weight involved.

33. *Guidance.*—There was to have been no essential difference between the system used for the R–10 and that used for the R–14, except that owing to the height of the R–14 trajectory, the Germans were aware of the possibility of difficulties in radio propagation through the upper layers of the atmosphere. The actual guidance aerials were to have been located in the rim of the rear skirt but
the final positioning of these would have been a matter for decision 25X1
at a later stage.

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R–15 Project

35. the R–14 project rather than with the R–15 since the former reached the SKIZZEN stage whereas the latter was only an AVANT project. 25X1 25X1 25X1

36. *Guidance.*— some radio control was necessary to the R–15 but it would prove a very difficult problem. This view was also expressed to ALBRING by PREIKSCHAT. Small conferences were held to discuss the guidance question and other points at which only Germans were present. There were, however, conferences with Russians (unknown) who visited the Island to discuss the R–15. The use of clandestine transmitters was an old Peenemünde idea, but of little use to the A–4 (or R–10). This idea may have been revived in talks on the R–15 which was more suitable for this type of guidance. The idea might have been included in the R–15 reports sent to Moscow. 25X1 25X1 25X1 25X1 25X1

the inherent difficulty of stability of control and guidance in the narrowing beam as the target is approached.

K–1 Project

37. there was no connection between the KOROLEV project and the German work on a lengthened version of the A–4. KOROLEV's interest in a lengthened rocket before they left Germany; KOROLEV had, he thought, made a prototype body in Germany. Later, at NII. 88 sectioned, lengthened tank which was possibly a prototype for K's work. BLASS and other Germans had worked on a proposal for a lengthened version of the A–4 on the Island, If this had been connected with the KOROLEV project by anybody, the information might have come through BOSH-KOTSUBINSKIY, 25X1 25X1 25X1 25X1 25X1 25X1 25X1 25X1 25X1

38. KOROLEV's own interest lay chiefly in the constructional and propulsion fields. He was not much interested nor was he competent in rocket electrics, nor in the general electrical field.

39. The project chart of the K–1 was seen in an office at the time of the 1948 R–10 conference. It was like the A–4 but with special tanks and longer. 25X1 25X1 25X1 25X1

40. KOROLEV never quoted the range of the K–1. 25X1 which R–10 modifications (of the A–4) may have been incorporated. KOROLEV said he thought the separable warhead was a good idea 25X1 KOROLEV would have adopted it. 25X1 previous estimate of the range of this rocket on this and similar assumptions as to length, tankage. 25X1 25X1

the course setting gyroscope unit developed by MAGNUS, the Germans asked for particulars of the appropriate flight path and were given a diagram which showed the same characteristics as those given in the Sanger-Bredt report (fugoid, or sinusoidal). 25X1 25X1

42. SHINEL'SHCHIKOV requested WASSERFALL ballistic studies probably in the summer 1948 which led the Germans to think they might be firing them in the autumn.

The Russians (unknown) interested in this came, it was thought, from NII. 88 where the WASSERFALL project was worked on. [redacted] no other institute working on WASSERFALL except possibly the Ministry of Communications, which might have worked on the control and guidance system. [redacted] 25X1

TAIFUN project

43. [redacted] the TAIFUN combustion chambers being made were for a liquid fuel rocket. [redacted] There were German specialists at NII. 88, however, who knew both types, *e.g.*, APEL in UMANSKI's workshop and HARNISCH and MIETH (a young man) working for UMPFENBACH. [redacted] 25X1

SATELLITE projects

44. [redacted] 25X1

" There were no satellites over the Island."

GUIDED WEAPON TECHNIQUES

25X1

A.—Aerodynamics and Ballistics

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Quality of Research

46. 25X1

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work done at TsAGI was based on what ALBRING had told 25X1

about the data and results in some reports prepared by TsAGI on model tests 25X1
in connection with basic research. ALBRING, in fact, drafted a letter to TsAGI, criticising the results and requesting that the experimental work be redone. It is not known whether the letter was sent on by the Russian director on the Island or not. ALBRING complained that faults were apparent in every case. Some figures in the data must have been wrong and these led to results not in accordance with expectation.

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47. Water channel work was done to obtain aerodynamic data on the problem of warhead separation.

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Heat Transfer

49. 25X1

the Russians learnt of heat transfer problems for the first time in 1947 applies only to aerodynamic heating on rocket re-entry to the atmosphere. The Russians were well aware of other heat transfer problems, *e.g.*, in rocket combustion chambers. They did not at any time, however, suggest to the Germans how the problem of aerodynamic heating might be solved.

B.—Control Techniques associated with Missile Activity

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Control Systems for R–10, R–14 Projects

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51. 25X1

gaseous oxygen was to have been used for the pneumatically operated servos in the R–10, and 70% alcohol in the hydraulic servos in the R–14. 25X1

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the question of 25X1

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compatibility of fluid with sealing materials would not be any problem. The Russians had available good quality synthetic rubbers. some difficulty might arise in using pneumatic servos and in fact, BLASIG did experience trouble because of compressibility. BLASIG should have foreseen this trouble, which was due to an acceleration effect on the mechanical parts such as the piston. If parts were so positioned as to minimise the direct compressibility effect then there would be a corresponding increase in friction effects. acceleration effects would prove to be a major problem in the design of control gear and missile servo systems, and in relay functioning

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R–10 Control System

52. The gyroscopic stabilising system to be employed in the R–10 project did not differ basically from that of the A–4.

53. Fig. 8 shows an edited version of the rough sketch to illustrate Small gyroscopes which have previously been variously described as " electrically tied turn indicators," " electrical spring rate gyroscopes " and " mixing gyroscopes " are employed to measure rates of change in the angles of missile pitch, yaw and roll. The gyros are electro-magnetically restrained by suitable field windings. Voltages proportional to instantaneous position of the gyro axes are picked off small centre tapped potentiometers and these outputs are integrated through RC networks. The outputs for each axis are fed into a mixing unit thus giving rough values of heading plus rate of change of heading in the pitch and yaw signals. The rate gyroscope is considered adequate for roll stabilisation as it is estimated that an error in roll of up to 10° is tolerable before any significant steering error develops.

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54. The pitch and yaw gyro field windings are arranged to receive input command signals from a programme rotary time switch for about twenty seconds after firing. This programme steers the missile into the fixed " axis " of the ground receiver antennæ array. The ground command system then takes over and command signals are fed to the two gyroscopes via the airborne receiver. Command signals (at a different level) are likewise fed to the mixing unit, first by the programme switch and later by the airborne receiver.

55. The only items which are new in the above arrangements as compared with the A–4 are the small (" MARKGRAF ") gyroscopes and the capacity integrating networks. The essential difference between the system described and that for the A–4 rocket is that in this case the accuracy of steering is dependent on the command control guidance system; the gyroscopes' function is solely the maintenance of missile stability.

56. The facility for altering the R–10 control constants as altitude varies was not in fact included in the German design. if such a facility should be required it could easily be incorporated. potentiometers in the field winding circuits of the azimuth and elevation gyroscopes. These potentiometers could be programmed to vary the control constants appropriately as altitude changed.

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57. Five sets of the gyroscope units for R–10 control were built. These were intended for test in A–4 rockets after Bahnmodell experiments had been completed. At the time, since the radio system was not then completed, the gyro units were to have been arranged as for the old A–4 system, the radio units being incorporated later. In fact, no actual experiments were done by the Germans.

Instrumentation

Selsyns

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58. The Russian selsyns were from production stocks. In size they ranged from 60–70 mm. up to 120–130 mm. in diameter.

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Gyroscopes

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59. an example of a powder propellant driven gyroscope at NII. 88.

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Potentiometers

60. A sine potentiometer, of a printed type was required for use with the rotating head of the test apparatus 25X1

Amplifiers

61. the Germans themselves made magnetic amplifiers using Mumetal from a rotary convertor which they had. 25X1

Statoscope

62. UMPFENBACH on a constant altitude measuring device. the mechanical development being done by UMPFENBACH. The instrument was a pressure measurement device and employed a corrugated diaphragm which was supplied from stock by the Russians before the design work was carried out. Because these diaphragms were apparently from production stocks, 25X1 they were being asked to carry out development in parallel with Russian 25X1 work on a similar project. The diaphragms were 130 mm. diameter and were of "bronze." The operating pressure was 100 mm. water. 25X1 UMPFENBACH in deflection 25X1 measurements; limit stops were fitted corresponding to pressures of the order of 1 atmosphere. 25X1 when the request was made for modification 25X1 to permit a range of settings upwards from 6 km. height the upper limit was reduced from 14 km. to 12 km. Originally, the Germans had proposed to measure altitude from the ground and transmit a command signal to set the instrument. The 25X1 Russians insisted, however, that the instrument be capable of pre-setting on the 25X1 ground. which Russians were concerned with this project, they "came from Moscow" and were known to UMPFENBACH as they had visited the latter at NII. 88; they were believed to be from another Ministry. 25X1 25X1

C.—Propulsion

63. there was some interest in hypergolic fuels, but this was for WASSERFALL. The Russians had such fuels, but work was not done on them on the Island. 25X1 Such work might be classified as Secret, in 25X1 which case he would not expect the Russians to say anything about it to the Germans.

64. SIEGMUND said he did some work on a gas generator system for turbine drive when in Berlin, using solid propellant. LANGE, in 1946–47, when he had nothing else to do, wrote a report on the same subject. 25X1

Propulsion Research as part of work on R–10 and R–14

65. A programme of experiments was carried out on the small test stand and parallel work was done in the chemistry laboratory. The work included studies of the combustion of alcohol at high temperature, spectroscopic studies on flame

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temperatures, and gas sampling for analysis. The chief work in this field was that on the gas bleeding tests carried out on the small test stand, and the programme for full-scale tests at Kapustin 25X1
which was prepared. Most of this work was carried out by 25X1
Russian personnel, although design and detail construction work was left to the Germans.

66. Theoretical work included the study of heat transfer in the motor and there was a supporting experimental programme to investigate combustion chamber cooling problems. The latter was suspended at the time of the R–10 study, but was revived during work on the R–14.

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PAUER was the most capable of the Khimki 25X1
design group and has pointed out that PAUER had left Khimki before work started on the 100-ton thrust engine.)

the development was a logical extension of the Peenemünde 25X1
and Lehesten work.

D.—Guidance

Ballistic Rocket Guidance 25X1
25X1

68. there were to have been no differences, either in 25X1
principle or in instrumentation, between the systems for the R–10 and R–14 rockets.

69. Describing the R–10 guidance receiver array, the distance 25X1
between the vertical pair of antennæ as 2 to 3 metres, and between the horizontal pair as 8 metres. This was possible because the accuracy of measurement required from the vertical pair was less than that required from the horizontal pair and it made for easier construction of the equipment. The positioning of the receiver 25X1
aerials was done as a unit since all four were rigidly mounted on a common framework. the receiver would 25X1
be set to the correct angles (azimuth and elevation) in the field. This was done 25X1
experimentally on the Island using the 30-metre tower
at a distance of 100–200 m. what type of 25X1
transmitter was put on the tower for the tests, to obtain representa- 25X1
tive results it ought to have been the missile transponder. 25X1
A complete ground station was built but it was not finished until after the work started on the R–14.

70. using the aircraft in trials of the airborne equipment 25X1
would result in comparatively low Doppler frequencies, it seemed 25X1
to be effective in the tests. no proposed modifications to the circuits 25X1
to allow for higher frequencies when a missile was used. no 25X1
modification would be necessary, but believed that the final answer would only be
obtained when a missile was fired. the 25X1
accuracy of the guidance test results. PREIKSCHAT said the tests were successful but no accuracies were mentioned.

71. 25X1
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72. the method of ensuring successful 25X1
rocket entry into the "fixed beam." originally it was proposed to 25X1
use a radio system (*i.e.*, radio command signals) with a moving "beam," but that later they were compelled to revert to a mechanical programme to get the missile into the beam, this programme extending over the first 20 secs. or so of flight. 25X1
25X1

73. the idea of a moving "beam" was considered but discarded. there were mechanical difficulties (associated with the proposed selsyn drive) in the way of achieving smooth upward traverse of a moving aerial array and that rigidity of the receiver array axis was essential for successful "beam" guidance. If this "beam" is fixed, the rocket can be successfully programmed into it, but there is no need for entry into the beam to be at any closely prescribed point.

74. The problem of upper atmosphere effects on radio wave transmission had been a topic in the discussions on R–15 guidance. PREIKSCHAT discussed this with the Russians.

Bahnmodell

75. some actual components could be connected to the Bahnmodell. Other parameters, *e.g.*, missile inertia and aerodynamic coefficients would be set in suitably reduced form, to an accuracy of about 10%. The Bahnmodell was used to give qualitative answers on stability, &c., and was not used for accurate computing. There was therefore no need to set in data to a higher degree of accuracy than that quoted above. The final output accuracy would then be of the order of 10%–20%. Consistency was reasonably good and he thought that, over a period, it would probably be within limits of 5% to 10%.

Telemetry

76. NEIDHARDT or any one else having worked on the MESSINA "N" equipment in Russia either on the Island or elsewhere. NEIDHARDT was working on this development in Germany before the deportation.

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space was allowed for telemetry equipment to be built into the R–10 experimental warheads (see paragraph 25 (*a*)), no actual telemetry hardware was ready to be installed.

77. *Homing Heads.*— the seeking devices which, were being worked on by the Ministry of Agricultural Machinery. The statement, previously reported, had been made to him purely to illustrate the type of work the Ministry could be engaged on.

78. *Batteries.*—Dry batteries were available in the 100 volt to 1,000 volt range. what was recognised as an ordinary type of dry unit, used in Western countries for building up any required stock of cells using a simple 1½ to 2 V dry cells. The Russians used all the usual types of dry and wet cells, no knowledge of any novel development in this field.

E.—Electronics

Valves

79. The subminiature valves were pentodes and triodes. Subminature valves were not used on the Island. Even during the last phase SCHMIDT, in his work on a counting and frequency measuring device used ordinary miniature double triodes. standards taken from foreign literature might have been published in Russia before production valves were available, but altered later to accord with actual performance. a case of gas filled valves, used for voltage stabilisation, supposed to have been of a certain specified standard but whose useful range diminished after a short time in use.

80. *Printed circuitry.*— printed and potted circuits from popular technical literature, which gave particulars of new techniques. . If they were supplied they came too late for his purpose. a request for printed sine-potentiometers which he wished to use in his work on the antenna measuring equipment done in the last period on the Island

25X1

81. *Components.*— from the point of view of temperature effect, the electrical components in a missile system would be the most critical. Electrolytic condensers, especially, would be sensitive to temperature changes and extremes. In Russia, the latter were available in two classes; for Low Tension work, one type was suitable for operations down to −50°, while the other type was for normal temperature working. The problem, however, was partly eased by the fact that most equipment would, while operating, " provide its own heating." 25X1

F.—Materials and Materials Testing

82. GOST standards were used throughout all work Some materials were very good, some bad, but standards were for the most part maintained. He mentioned adhesives, paints and bakelites as being generally of a high quality and when questioned specifically on these, cited QUESSEL'S work on an electro magnetic clutch The adhesive used in assembling the laminated steel core was prepared by mixing two constituents, was black in colour and very strong. A universal adhesive in general use was KL 3 or 4 (or, perhaps KF 3 or 4). It was plastic-based and yellowish in colour. An organic solution similar to shellac was also in use as an adhesive. 25X1 25X1 25X1

83. one or two instances when the Germans had discussions with the Russians on the use of special materials. For example, IORDANSKIY and another Russian (KISILEV) were interested in the development of a corrosion resistant steel suitable for use in, say, fuel line valves. 25X1

84. At both Bleicherode and Soemmerda, the Germans had discussed among themselves the possibility of using wood in rocket construction. what the Russian reaction was to the proposals but an idea that they were neither impressed nor interested in the possibility. 25X1 25X1

85. the quality of the material used for the rudders of the A–4 rockets tested at Kapustin Yar in 1947. they were of graphite and when asked about the alleged difference in appearance (as compared with the standard A–4 rudder) any difference in appearance might be due to a different surface treatment or finish applied after machining. the rudders were made with material of Russian origin. they were probably machined at NII. 88 from blocks supplied by Siemens Plania. IORDANSKIY was interested in the rudder problem, but he was primarily concerned with the question of the metal to graphite attachment. at the 1947 trials this attachment was slightly different from the standard (German) fitment. A Russian technician, who worked under IORDANSKIY, was also interested in various aspects of the rudder problem. 25X1 25X1 25X1 25X1 25X1 25X1 25X1 25X1 25X1

86. *Materials Testing.*— additional information about IORDANSKIY'S materials test laboratories at NII. 88. They were modern and expensively fitted out; contained a lot of high grade equipment and instrumentation; were well maintained, clean, airy They extended along the whole of one side of the large A–4 assembly hall. 25X1 25X1 25X1

87. any Russian work being done on photo elasticity. MAGNUS did some work in this field at some time (in Germany) and that the Russians might have discussed this subject with him. 25X1 25X1

G.—Missile Warheads

88. the Russians had been told of certain German proposals for fragmenting warheads for A.A. missiles These discussions took place at NII. 88. The names of the Russians concerned were unknown HOCH was involved in the talks, and probably QUESSEL. CONRAD also may have been interested in the subject while on the Island. The discussions could only have been of a general nature. Wartime discussions in Berlin on the suitability of 25X1 25X1 25X1

various types of head had led to the conclusion that blast heads were not suitable for A.A. missiles whether the Russians subscribed to or were even aware of this view. The NII. 88 talks were concerned with the possibility of using a warhead with preformed fragments and of disposing these fragments along helical paths. 25X1

25X1

H.—Missile Testing

89. the Russians were interested in the question of noise in missiles. The Germans told them of certain results obtained in wartime at the Peenemünde test stand. maximum amplitude values as occurring at frequencies of between 17 and 20 cycles/sec. and at 200 cycles/sec. 25X1 25X1

90. In 1946–47, FERCHLAND did some work on a project for a missile testing laboratory. This project was to include provision for a vibration testing gear suitable for testing vibrations in the frequency spectrum 0 to 50 cycles, and having amplitudes of up to 2 mm. the Russians were not very interested in the project. 25X1

I.—General

Published Literature

91. Scientific periodicals were readily made available in the library on the Island, and Russian technical books could easily be obtained. The library was very up to date. POBEDONOSTSEV had a copy of a classified report on rockets, compiled just before the end of the war. 25X1

25X1

92. Among papers published by the Institute of Automatics and Telemechanics, by SOLODOVNIKOV, who was interested in problems of stability of control systems, and by TSYPKIN, who was interested in the non linear mathematics of control problems. 25X1

93. There was said to be a very large bureau in Moscow, responsible for translating foreign scientific papers. Also, translators in factories could make contracts with the bureau for translation work.

Upper Atmosphere Research

94. the Russian at the Kapustin Yar trials who was especially interested in upper air research 25X1 25X1

was from the Academy of Science in Moscow and thinks he was an Armenian. Only one or two of these heads were so fitted which particular missiles were used, or in what order these were fired. 25X1 25X1 25X1 25X1

Personalities with some experience

95. 25X1

GLUSHKO has a good deal of practical experience in propulsion work. MOISEYEV and FRANKL, are interested in rocket problems generally. 25X1

25X1

ORGANISATION AND ESTABLISHMENTS

Ministry of Armaments

96. the Ministry of Armament would control the whole missile programme or whether specialised aspects of the work might be under the control of other ministries. it would control the whole, but the responsibility for research and development in the guidance field for example might be that of the Ministry of Communications Equipment. In this connection it may be significant that in 1951 there seemed to be a shift of emphasis to guidance work. For instance, RYAZANSKIY, previously with the Ministry of Communications, took over POBEDONOSTSEV's work at NII. 88; at the same time HOCH replaced as Head of the German group on the Island. 25X1 25X1 25X1

7th Chief Directorate

97. ; the offices of this Directorate were located in a large building on Gorki Street, from the German V1-41 map of the Moscow area as being the Ministry of Armament building. interpreter escort on one occasion. KURGANOV is believed to have succeeded SPIRIDONOV as Chief Engineer of the Directorate. the Directorate was responsible for research and development, he thought it possible that it would also cover large-scale production. 25X1 25X1 25X1 25X1 25X1

Previous mention of the " Minister's representative " is now known to have referred to the Director of the responsible Chief Directorate—in this case the 7th. 25X1 25X1

N.T.S. (Nauchnyy Tekhnicheskn Sovet)

98. *Membership.*—The only possible additional member was KHARCHEV who wore Air Force uniform. 25X1 25X1

voting powers GONOR, POBEDONOSTSEV, FRANKL, MOISEYEV, TIKHONRAVOV and GLUSHKO. 25X1 25X1

99. *Authority.*— to whom N.T.S. was responsible. It was not responsible to NII. 88 although this particular body was known as the " N.T.S. of Institute 88." N.T.S. is certainly responsible only to some top level authority. It may be responsible directly to the Minister. 25X1 25X1 25X1

100. *Functions.*—Nothing is known which might suggest that N.T.S. met elsewhere than at NII. 88. the N.T.S. would be responsible for all Guided Missile work and at least some unguided rockets. Should this be not so then some at least might be expected to be members of any other responsible committee. The only evidence was that all services and a number of other ministries and academies were represented on the N.T.S. While some of the NII. 88 members were believed to have been away together at given times, it did not follow that this would be for an N.T.S. Conference in some other place. N.T.S. actually had executive power to allocate money in support of programmes; they would advise the appropriate authority as to how such money should be allocated. 25X1 25X1 25X1 25X1 25X1

Ministry of Ground Equipment

101. SPECHT and DZERZHINSKI were at one time in this Ministry and would know more about it. VOSKRESENSKIY was at NII. 88, where he was head of the Ground Equipment Section but he was not in the " Ministry of Ground Equipment."

Academy of Artillery Sciences

102. one member was TYULIN, who had been in Bleicherode and who was head of the ballistics group which worked on the 1947 trials at Kapustin Yar.

UNCO

Ministry of Communications Equipment

104. whether direct liaison existed between this Ministry and the Ministry of Armament. Normally information on control and guidance work on the Island would be passed to NII. 88. If any of the Russians working on the Island in this field had direct connections with the Ministry of Communications, the erection and operation of any future radio control systems at Kapustin Yar would probably be undertaken by a team from the Ministry under the general direction of KOROLEV, or other responsible officer.

Ministry of Agricultural Machinery

106.

Ministry took over certain responsibilities for this type of work in war-time and simply " held on to these " at the end of the War.

Movement in the Moscow area

107. When the Germans first arrived in the Moscow area, they were accommodated in a number of " camps." Initially they were confined to the limits of these camps; then, for a period of about a month or six weeks, they were allowed to go " where they pleased "; thereafter, they were again restricted (in 1947) to the areas immediately surrounding the camps, which they were allowed to visit under escort for such purposes as shopping. During this last period, a permit had to be obtained for visits to Moscow, under escort.

Residential Locations in Moscow Area

108. various residential camps to which German scientists had been sent

approximate location of these on a small-scale sketch map of the Moscow area. The locations involved were:— 25X1

109. *Bolshevo.*—The "camp" was in a very large, old, pre-revolution house situated five minutes from the station: it was let to the Ministry of Armaments by the Film Ministry 25X1

25X1

110. *Valentinovka.*— The camp consisted of old pre-revolutionary buildings, part of the property of a Soviet Ministry which he likened to a "Cabinet Ministry." 25X1 25X1 25X1

111. *Mamentovka.*—There were two separate locations here. Mamentovka 1 was occupied by German scientists from Zeiss, Jena 25X1
Mamentovka 2, formerly "The House of Mamentovka" was occupied by Germans from Bleicherode This building was he thought rented by the Ministry of Armament from some other Ministry. 25X1 25X1 25X1

112. *Pushkino*— a small place in which only people of minor importance were accommodated. 25X1

113. *Monino.*—This location was in a very large building. The people both lived and had their work rooms in this building; it was under the Ministry of Communications Equipment.

114. *Il'inskoye.*— 25X1
Here, the Germans lived in small houses and bungalows, rented by the Ministry of Communications. 25X1 25X1

115. *Zagorsk.*—The largest size of test stand originally planned was, 25X1
for 30 to 35 ton thrust engines. However, it is quite possible that larger test stands were contemplated. JAFFKE and PAUER were associated in the development plans and in 1947 they visited the proposed site near a village which had in it an "old church," which was "visited by tourists." JAFFKE would not talk about it. It was "TOP SECRET." SUKHOMLINOV went to Zagorsk. 25X1 25X1 25X1

116. *K.B.2.*— The term Konstruktsionnoe Byuro is very ordinary; such an office would exist in practically all factories, and the number would have significance only within the actual works. It could occur several times within a single Ministry, *i.e.,* at different sites. The K.B. at NII. 88 worked on the building layout for the Island. 25X1

117. *Khimki* (Engine factory).—The only work in connection with Khimki (of which GLUSHKO was Director) was in connection with the building of a test stand for a 25–30-ton motor. 25X1 25X1 25X1

25X1

25X1

Kimry 25X1

119. work done at Halle by the SIEBEL group in 1946. 25X1

120. *Airfields.*—There was a large civil airfield near Khimki or on the road to Khimki or Kalinin; it may have been on the left-hand side of the road from Moscow and there was a Metro station nearby. There was also a small military airfield somewhere along the route from the centre of Moscow to Pushkino.

121. *New Institute in Khimki Area.*—This apparently accommodated a large number of personnel among whom all Germans known to be there were specialists in some part of guidance activity. Regarding this latter fact, it would be strange if it were not subordinate to the Ministry of Communications, since many of the Germans believed to be employed there were previously employed within that Ministry. new institute is a large one; the work was sufficiently important to merit the occasional award of a Stalin Prize.

122. *Krasnoyarsk / Krasnogorsk.*—

UNCC Krasnogorsk as the town where some Zeiss personnel were working but does not know of any association GLUSHKO may have with it. GLUSHKO is still at Khimki.

123. *Shchelkovo.*— the presence of a number of German specialists at two places in this area. a small group of chemists was employed. At the other there was a larger group of electronic valve technicians (ex-O.S.W.).

Main Assembly Buildings (Previously known throught PW reports as Corpus II)

125. (*a*) the test rig for electrical components of the centre section and (*b*) the position of attachment of the tail section. Siemens spot-welding fuselage jigs in the building the assembly line was laid out basically for demonstration and that only 15 rockets were assembled. these arrived in completed sub-assemblies, there was no requirement for the whole of the Mittelwerk final-assembly line the line laid out post-war at Kleinbodungen. JASPER was in charge and would have full information. At one end of the building there was a workshop for bakelite components.

126. IORDANSKIY's materials Testing Laboratories were located on the first and second floors of a new extension running the whole length of the main assembly hall. These rooms were extremely well equipped.

127. machine shop in the assembly building all machine work was done in the next building where oil drilling machinery was manufactured. A-4 Motors were not assembled at Factory 88

128. *WASSERFALL Test Stand.*— It was situated "on the left, near the main entrance to the airfield." The German, HARNISCH, worked on it.

129. *Main Administration Building.*—This was located at the side gate to the factory on the Moscow–Yaroslavl road The building was identified as having a cupola type roof and being on the northern side of the entrance. The ground floor containing the library and conference room was reached by a flight of steps. The conference room appeared to be used by the librarians but was cleared for meetings of the N.T.S. On the floor above were the offices of GONOR and POBEDONOSTSEV.

130. *CHERTOK's Building.*—This was a new building several storeys high located behind the administration building but connected by a bridge.

131. *KOROLEV's Construction Bureau.*—This was located on the opposite side of the factory entrance road and was a modern multi-storied building.

132. G.S.P. 7 was the name given to a project section in the Ministry of Armaments. A group which came directly under its direction worked at NII. 88. 25X1

Kapustin Yar Range

135. The general area of the range consisted of undulating semi-desert country with occasional deserted villages. The Germans were in the area from mid-September and arrived back at NII. 88 in mid-December, by which time the weather was wet and transportation facilities were curtailed in consequence. Time spent in transit occupied one week in each direction. 25X1 25X1

136. In discussing the KOROLEV rocket (K–1) 25X1 the Germans assumed the firings of that rocket had taken 25X1 place at Kapustin, in the autumn. 25X1 this would be the usual time for firings as the weather 25X1 was suitable, fields were then cleared of crops and people had left the summer residences in the area. It was suggested to him that if the area were to be a permanent range, then the Russians would probably not bother about such items as annual crops and local summer residences. at the time 25X1 of the 1947 firings he believed that even if permanent plans had been made they had only just started to build at the range head. No doubt, if the range were a permanent one such details would not in future influence programmes; the range area would then probably be evacuated. 25X1 the Russians had started to make provision for permanent static test areas at Kapustin Yar.

The general area consisted of two main locations:—

(i) the base accommodation and administrative area;

(ii) 25X1

The Base Area

137. This consisted of a railway siding within sight of Kapustin Yar where were parked the main part of the FMS trains on two parallel lines. A few units were taken further up to the operational area.

138. Nearby was a general dump alongside the line, consisting of machine tools and various pieces of equipment in addition to building construction materials. Everything was out in the open and covered in sand through being completely unprotected.

139. Some 2 km. from the FMS siding, and 3 km. from Kapustin Yar was a small airstrip.

140. —This was believed to be 25X1 at a distance of half-an-hour's drive by car over a rough track. Approach by rail was on a different line to that of the base sidings, and the line apparently left

the main Kapustin Yar–Astrakhan line at a point further south-east crossing a gully not far from the main line by a wooden bridge.

The operational area consisted of:—

(i) A horizontal test stand.
(ii) A static firing test stand.
(iii) A firing point.

141. *The Horizontal Test Stand* —This was located 5 km. from the firing point and 5 km. from the static firing stand. It consisted of new wooden buildings and a railway siding on which were the laboratory coaches of the FMS train. 25X1

142. *The Static Firing Test Stand* —This consisted of a stand, overhanging a gully. A deserted village with fruit trees was located 1 km. away down the gully and another was 3 km. further. Near the test stand was a siding on which were the repair waggons of the FMS train. 25X1

143. *The Firing Point* —This was 3 km. from the static firing test stand and 5 km. from the horizontal test stand. There were no particular land features nearby. Two bunkers were sited some 200 yds. from the actual point and a Messina-Hawaii station was located nearby (ref. sketch). This was reached by a track. F.M.S. Waggon the firing waggon, was located at an unidentified situation 3 km. away. 25X1 25X1 25X1

General Information

144. 25X1

The transport aircraft used to carry them to the area was a 12–15 seater twin-engined aircraft. In addition he believes that there was a small bi-plane which was used possibly to carry out survey or reconnaissance flights to the target area. 25X1 25X1

25X1

146. As regards the number of rounds actually fired during the 1947 tests, VIEBACH's estimate (12) is probably correct. 25X1

any day in which there was more than one firing, although it is possible that on one day there may have been two firings. The German group were at at the range for a period of two-and-a-half months, of which the last 7–14 days were required for clearing up and preparing for their return to the Island. This would mean that the firings were spread over a period of approximately two months. 25X1

147. The Germans had suggested that sound recording gear could possibly be used at the target end of the range, 25X1

Immediate reports as to whether the firing was good or not, were available at the range 25X1 25X1

there was a Russian team at the impact end of the range but no Germans, some type of detection apparatus must have been employed to mark the fall of shot, approximately at least. Although a telephone system was in operation 25X1 25X1

25X1

there were any lines to the target area. The firing records were kept in an office on the F.M.S. train, in TYULIN's charge. 25X1

148. Later, after the German group moved from NII. 88 to the Island, the Russians are believed to have tried to evaluate some of the trials results. Their first attempt was apparently not satisfactory, and WOLFF, SCHULZ, MULLER, VIEBACH, PEHLE and MATHIES had to go to NII. 88 to inspect the original data in the F.M.S. train there.

25X1

150. Minor repairs were carried out at the site whereas major repairs necessitated return of the components to NII. 88. never heard of components being sent to Stalingrad for repair. Some welding operatives 25X1 25X1
came from a Ministry of War factory in Stalingrad 25X1
during the 1947 trials. the Russians would set up suitable 25X1
facilities on the site if the range were to be in permanent use. The rockets for the 1947 trials were stored in well-built buildings which satisfied all storage requirements. There were also large workshops at the range in which repairs could be carried out. liquid oxygen was supplied from 25X1
Moscow in German-type vehicles. the loss rate at 5 per cent. 25X1
per day. The journey from Moscow might be as little as three days, but 25X1
the deficiency on arrival corresponded to about 35 per cent.

(NOTE.—If the daily loss rate (in German W.W.II vehicles) is materially in excess of 5 per cent. capacity then the supply point would be expected to be located much nearer Kapustin Yar than is Moscow.)

151. Delays in the firing programme were often due to hold-ups at the static test stand (this was not used during the later firings), or to having to await the arrival of V.I.Ps. Normally there was no set time for firing and when a rocket was ready, it could be fired. the best time for firing would be 25X1
in the afternoon when the sun would have moved out of the line of sight. There was no difficulty in administration of personnel in order to obtain early morning firing, as tents were available at the sites. Sometimes they started work at 4 a.m. and fired at 8 a.m. Under reasonable conditions the Kine-Theodolites could follow to beyond fuel cut-off, *i.e.,* to 15–20 km. 25X1

25X1

152. Firing procedure followed normal German practice. There was a central time marker station which was linked with all Kine-Theodolite stations. The latter gave out their individual readings of bearing from just before firing until about 10 seconds afterwards. Local pre-warning was given by loudspeaker, and control was from one bunker. There was a " count-down " in minutes from zero minus 5 or 3 minutes, then in 5-second gaps from zero minus 1 or ½, and finally in seconds, before the word " Agon " (fire).

153. Communication with the target was bad, and normally the Russians went there by air, but there were tracks which were believed to lead to the same area.

154. The actual firing was done by two entirely separate teams. One, a military team, was associated with the F.M.S. train and was under the control of KOROLEV. The other, a civilian team, was controlled by VIEBACH 25X1
The two teams were separately responsible for alternate 25X1
firings.

155. first heard of Kapustin Yar as " FILIALWERKE II of NII. 88 " 25X1
in 1950. This was at the time of the special trials arranged to test the turbine drive system utilising gas bleed from the combustion chamber. 25X1
t will now be a permanent establishment with a resident staff but that other 25X1
groups will visit there from time to time to carry out tests.

Other Ranges

156. 25X1
25X1
a range was
required where they could fire rockets to a greater range (than the A–4).
Kapustin Yar was not suitable but that there were other places. 25X1

25X1

PRODUCTION, STORAGE, TRANSPORT, &c.

Standards

Russian factory propaganda films, of which there were a great many. For example, a film showing new techniques of electro-polishing, another on cutting metals under water films illustrating the best way of performing particular tasks (*i.e.*, on time and motion study) which were good propaganda, but these were usually displayed originating from an idea of or invention by a worker. a technique new which involved injecting white droplets of the same density as the working medium to trace fluid flow in wind tunnels. the high quality of certain adhesives . As to production, standards could always be maintained by adequate control.

158. the use of GOST standards. He said they were used throughout all work certain materials were poor in quality and others were of good quality, generally speaking prescribed standards were maintained.

Inspection

159. the meaning of the letters OTK. they stood for "OTDEL TEKHNICHESKOGO KONTROLYA" (Technical Control Section) such a section is maintained in all places where work is being done. The stamping of these letters on an article, did not *per se* mean that the article was in series production. The control (*i.e.*, inspection and testing) operated in the workshop (*i.e.*, at the bench or "on the floor") and also at the end of the operations (*i.e.*, final inspection), both in production shops and in research and development workshops. It might be administered by the military in some cases. the presence of the letters on a product gave no indication whatever of quantities produced—these might range from small numbers (much less than 1,000) up to really large-scale production. It was not, however, placed on those parts which were produced on the Island for their own use.

Special Machine Tools

160. regarding the availability of any special machine tools for precision work, he described in detail a jig borer at NII. 88, There was another identical jig borer on the Island which was, however, of Russian manufacture, although it too was referred to locally (both by the Russians and the Germans) as the "SIP."

Quality of Man-power

161. the highest skilled workers would be found in mass-production factories rather than development establishments. More money could be earned by production operatives since it was more difficult in establishments to fix norms and hence to earn large wages. transfer from one factory to another could often be arranged, usually through "knowing the right people" in spite of the high priority which might be accorded development work.

162. the use by individual operatives in NII. 88, of slip gauges. the workers concerned must be above average skill slip gauges were used by possibly one in four of the operatives in the institute. a certain percentage of highly trained men would have to be retained in any establishment

Component Production

163. 25X1
Russian made Selsyns. 25X1
hese were from production and said that the bakelite parts were moulded. 25X1
This, indicated quantity production. The instruments were packaged in 25X1
production type containers, appropriately marked with type numbers, factory
markings, &c. These examples were seen on the Island in 1952; 25X1
they were an overflow of some production stock of which a quantity might have
been held at NII. 88. 25X1

164. in component production there was no special 25X1
reason to suppose that the Russians would be less well equipped than the West and,
in fact, he believed they would solve the problems involved. Asked specifically if
this applied to control gear, the production of Sperry-type 25X1
gyros and control systems and selsyn systems, as examples. These were in
production and were to be seen in catalogues. presence 25X1
of a component description in a catalogue did not prove it was in production.)
The standard of production necessary for successful guided missile operation
could be achieved by ensuring adequate technical control.

Timescale for Production 25X1

165. the time required for rocket production. 25X1
estimated 1–14 years for planning, tooling up and getting under 25X1
way. 25X1
it would take two years after the first successful test firing of a complete 25X1
rocket, such as the R–10 or K–1 for series production of the missile to get under
way. the Russians plan a development schedule rigidly and fix 25X1
a time by which the work should be completed. 25X1
All would therefore report that they were ready 25X1
at the planned time, although this might mean that they would have to fire rockets
which were not as good as they should have been; in fact the conditions under which
development took place in Russia were similar to those in war-time Germany.
if a firing programme went badly wrong they would hold up 25X1
any preparation for production. because of the pressure to 25X1
adhere to an inflexible development programme the ensuing firing programme
would be protracted by normally avoidable difficulties.

166. no one in a position of high responsibility could 25X1
really know details of results of firing trials and senior authorities would have to
rely on the reports of chief constructors who might withhold unfavourable reports
so long as the rocket apparently functioned successfully. KOROLEV might not
tell the Minister the truth if firings were not completely successful, bu 25X1
then probably recommend postponement of production, at the same time claiming
that the firing programme must continue.

167. The Russians find it very difficult to understand that a rocket which
works all right on a test stand may not work well in flight; that one cannot fire
ten per day for three months but that one has to continue one by one to a
"successful" test. they might even go back to the research 25X1
stage if a major failure occurred at the firing of the first complete rocket.

168. the Russian firing programme might be to build 25X1
two or three rockets and to fire these. If they were successful, about 100 rockets
would be made and fired. Should a succession of say ten failures occur all firing
would cease.

Possible R–10 and R–14 Production

169. In estimating a two years' period to reach the production stage after
first successful firing, no great difficulties would be met in 25X1
the manufacture of the R–10; electrical components were available; the most
difficult components, namely, the combustion chamber and turbine pumps, were
similar to those of the A–4 whose production problems were known to the Russians.
the Russians would carry out a programme 25X1
similar to that for the R–10 when producing the R–14. Assuming they had
proceeded with the R–10 or some other rocket, they might have learned a lot from
their experience of such work. they would need to produce 100–200 25X1

rockets for a three years development programme for the R–14. They would not start production before the successful firing of a complete rocket. They might, however, think about production and might even start planning production of certain components.

170. On the other hand, the R–14 was a new type of rocket; it would require new turbines and pumps; and new tools would be required. Also the combustion chamber was different from that of the R–10. it would have taken the Germans three years to have made one (*i.e.*, up to the end of 1952). It might have taken the Russians longer due to their cumbersome organisation and methods of working and their lack of background. Indeed, the Russians themselves said that an R–14 programme would take a long time. If the Russians had accepted the idea of an underground factory, production would take a longer period (than the two years estimated as being necessary for R–10) after first successful firings. The supporting experimental programme would call for the provision of a suitable test stand and construction of a 100-ton thrust motor with a combustion chamber operating at a pressure of 60 atmospheres. Development cooling tests would have to be run (*i.e.*, a scaled-up version of tests already done by the Germans on the 1 ton test stand on the Island). 25X1

171. a possible time scale was 1 year or more probably 2 years for completion of successful firing trials (1954), production to start 2 years or more later, *i.e.*, end of 1956 or later. 25X1 25X1

172. *K–1.*— the alleged firing of the KOROLEV rocket, 25X1 25X1

the firing was not so good and KOROLEV must have had trouble. These remarks were made in early 1950 following firings to have taken place the previous Autumn. 25X1 25X1 25X1 25X1 25X1

173. *Native programme.*— 25X1

Russians could have developed and what was the likely time scale. 25X1

whether they would produce the K–1 or the R–10 25X1

the final rocket would be a mixture. it could be in production now (July, 1954) if the work had continued under pressure right through to the production stage. the known factors in the time scale in detail, 25X1 25X1

the possible progress as follows:— 25X1

(*a*) In 1948 the R–10 project was completed. 25X1

(*b*) In 1949 further design details were gone into of the firing of the KOROLEV rocket. 25X1

(*c*) Tanks longer than the standard A–4 tank, were made at NII. 88 and Germans had to instruct the Russian welders on the techniques involved. KOROLEV showed him a sectioned tank that had been made. 25X1 25X1

(*d*) Many of the components for rocket production were, being made on a small production basis at NII. 88. These included such things as the aluminium casting for the Rudder machine. 25X1

(*e*) In 1950 the Russians, did experimental work on combustion chambers (Gas bleeding tests) using the German experimental plans and equipment. in 1951 experimental work should have been completed if no major difficulties had arisen and the firing of a successful rocket could have been made by the end of 1951. 25X1 25X1

allowing two further years to plan and start production, the first rockets (possibly a compromise between R–10 and K–1) could have come off production at the end of 1953. 25X1

Storage 25X1

174. The Russians paid a good deal of attention to the question of storage. There were excellent storage conditions, from the point of view of temperature and humidity, in the building on the airfield at NII. 88. The Russians had been given the German instructions for A–4 storage in 1946–7. At Kapustin Yar the A–4's were stored in well built buildings which satisfied all normal requirements for good storage conditions.

175. The " lacquer " on the missiles fired at K.Y. in 1947 was black and white paint; it was applied on site, to facilitate visual observation and photography, and was not a protective finish. it did not stand low temperature conditions well. 25X1

176. the protection of components and equipment generally. domestic steel equipment was always well protected in stores with a thick yellow oil, unidentified, which was viscous at normal temperatures but became hard in cold weather. Tools were also protected in this way. This oil or grease was widely used all components, stored before final assembly to be similarly protected. The technique of bonderizing metals is well known to the Russians. (25X1 25X1 25X1 25X1 25X1

Operations in Extreme Temperatures

177. 25X1 the components most sensitive to temperature were the electrical ones but as they " provide their own heating " outside temperature is less critical than it might otherwise be. Electrolytic condensers might be the most critical of the electrical components The Germans did some calculations on the body expansion/contraction within the temperature range –50°C to 50°C. There was no comment by the Russians on this. the R–10 would operate successfully in this range. 25X1 25X1 25X1 25X1

Transport

25X1

179. *Special transport for missiles.*—The Meilerwagon used for R–10 transportation would be different from the original German vehicles used with the A–4. There would be no inspection platforms, or heavy electrical connections.

180. The warhead could be carried on the Meilerwagen and would be separate from the main fuselage as it would have to be attached, while the rocket was in the vertical position. The warhead would be carried on a V cradle whilst in the travelling position. Because of the shortening of the motor compartment and consequential alterations in weight distribution, the lower U cradle for carrying the fuselage was to be moved ½ metre towards the tail of the rocket.

181. No Strabo cranes were initially designed, nor was a command firing car, but the Russians said "Let us have some."

182. The design of the firing platform waggon was modified by strengthening the supporting legs and by incorporating a foam fire extinguishing jet in the top of the flame deflector pyramid.

183. *Rudder transport.*—Some Russians (names unknown) were interested in the problem of transporting the carbon rudder vanes at Kapustin Yar in the 1947 trials. These were carried in special packing cases of the type previously used in Germany, but the cases were Russian made.

Oxygen production on the Island 25X1

184. Each set had a 2½ metre vertical column, built up in sections. The sets used on the Island were Russian-manufactured and the manometers had Russian calibrations. They had 2-stage piston-operated compressors giving a maximum of 200 atm. and driven by electric motors. 25X1 25X1

25X1

Troop training

185. VOSKRESENSKIY interested himself in troop training. He was the leader of the training group at Bleicherode and worked in parallel with VIEBACH who also trained a firing team.

(NOTE.—He was also chairman of the discussion group on Ground Equipment at the 2nd N.T.S. conference on the R–10.) 25X1

the Russians would have learned handling techniques, &c., and firing drill at the Kapustin Yar range.

RUSSIAN PHILOSOPHY IN THE USE OF G.W.

186. [redacted] 25X1

[redacted] Russians would prefer an aircraft type of vehicle to a rocket [redacted] 25X1

[redacted] 25X1

187. [redacted] 25X1

[redacted] work was not continued on the R–14 project. [redacted] even 25X1
if the Russians had accepted the various project reports and had made no comments on these, this would not necessarily indicate lack of interest. In fact, 25X1
one or two queries were put to the Germans after the R–14 study was completed. Tasks specifically requested by the Russians included a design for a mobile operational column for firing the R–14 (in contrast with the German proposals for an underground factory with associated launching site) and also a design study of the use of dural instead of steel [redacted] 25X1

188. [redacted] 25X1

(*a*) In 1947, POBEDONOSTSEV told [redacted] that much high-level interest had been aroused by the SANGER-BREDT proposals and that the project had at one time " lain in front of STALIN " [redacted] 25X1
25X1
[redacted] criticised the SANGER- 25X1
BREDT proposals adversely [redacted] 25X1
absence of any Russian reaction to this criticism. [redacted] 25X1
[redacted] criticism had not gone " right to the top." 25X1

(*b*) GAYDUKOV and one or two other Russians had, at the time of the visit by the commission from Moscow to the Island in mid-1950, commented on the fact that the R–15 required much less fuel than the R–14 and t [redacted] 25X1
the cost of materials in the R–15 might well be higher than in the R–14.)

(*c*) Although the R–14 project had been worked out in considerably greater detail than had the R–15, about the same degree of interest in each was shown at the time of the visit to the Island of the above-mentioned commission. This, [redacted] reflected Russian lack of favour 25X1
for the R–14. No one discussed the R–14 project seriously [redacted] 25X1
At the same time, he does not know whether the R–15 was discussed in detail with ALBRING or not.

(*d*) [redacted] the R–14 design constituted too radical an advance 25X1
on the R–10 project for it to appeal to the Russians as a practicable weapon. [redacted] the Russians had gone ahead with a project 25X1
similar to the R–10, but in the case of the R–14 any such decision would be fraught with the risk of discredit in the event of failure. Such a man as KOROLEV might have gone on with an R–14 programme but even he might have misgivings. The ultimate decision would be taken by USTINOV who might not be in possession of all the facts, as certain of the aspects involved might be suppressed at a lower level [redacted] 25X1

(*e*) [redacted] if the Russians had decided to proceed with work 25X1
on the R–14 some at least (say 10 or 12) of the rocket technicians would have been detained in Russia for a longer period, just as HOCH and others had been detained for further work on guidance.

(*f*) The work on the course-setting gyroscope and on the statoscope in the last phase on the Island was done at the request of the Russians. [redacted] both these items might have been under development 25X1
in support of a project such as the R–15. In particular, the maximum height range of the statoscope was the same as the nominal flight path of the R–15 (14 Km.).

189. [redacted] the development of a 100-ton thrust motor at Khimki could have any significance in connection with possible subsequent development of the R–14. [redacted] the Khimki motor might quite possibly be considered in relation to the (later) R–14 and that if a man like GLUSHKO, who did not care to work with Germans, were interested or involved in an R–14 programme then any Germans would probably be excluded from the work. [redacted] this tended to contradict the argument implicit [redacted] it was possible that the SANGER-BREDT project might find support in some other Ministry such as the Air Ministry to which GLUSHKO was responsible, and that the 100-ton Khimki motor was a possible motor for the boost phase of a SANGER-type missile. 25X1 25X1 25X1 25X1 25X1 25X1

[redacted] 25X1

25X1

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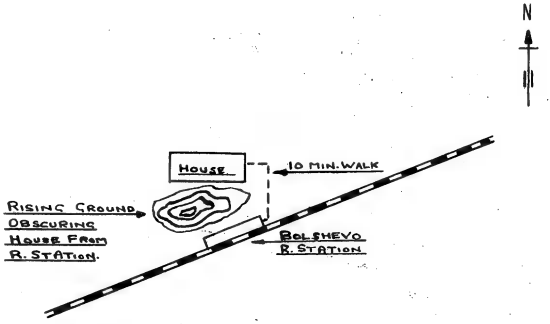


FIG2

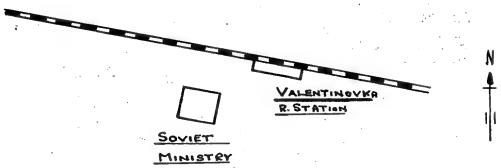


FIG3

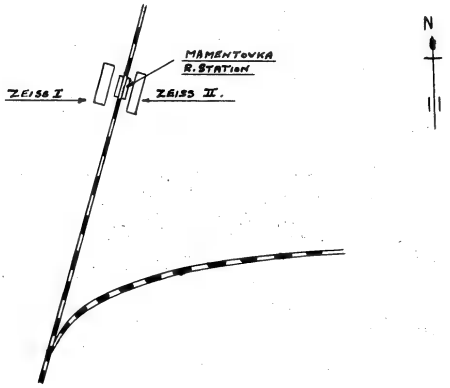


FIG 4

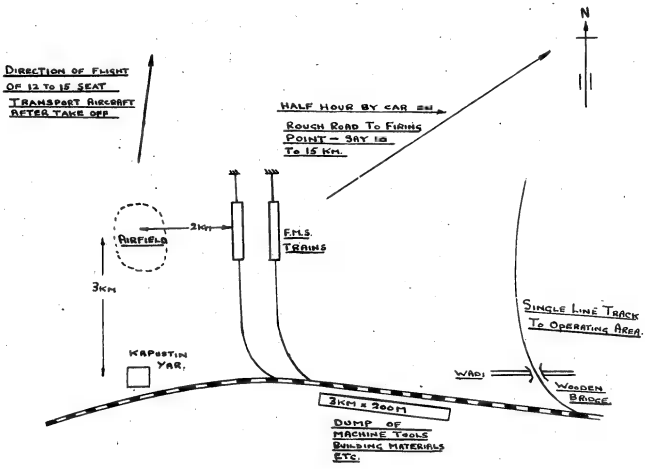


FIG 5

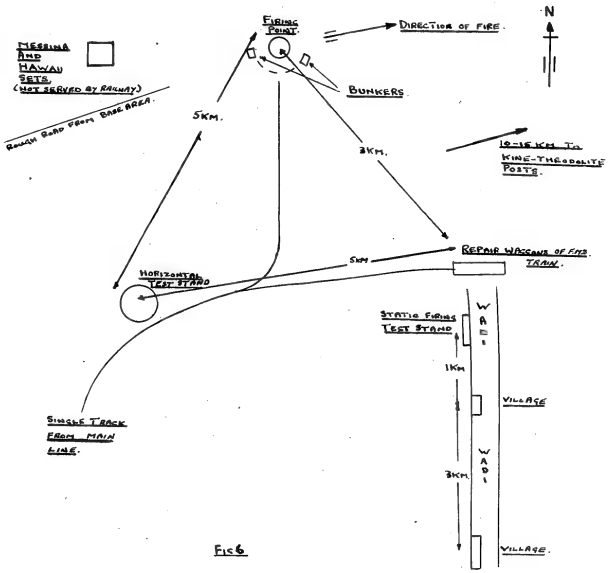
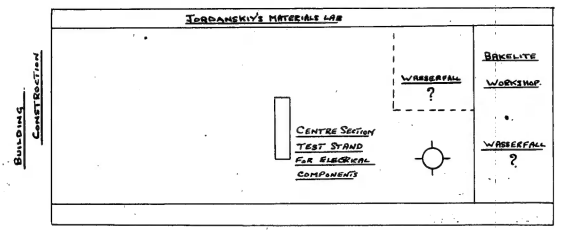
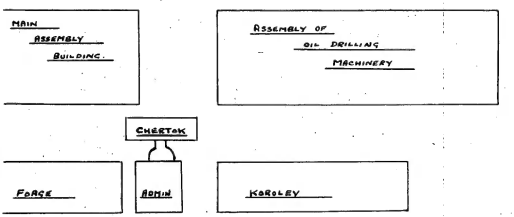


FIG 6

MAIN ASSEMBLY BUILDING.



MAIN FACTORY AREA.



ADMIN BUILDING AREA.

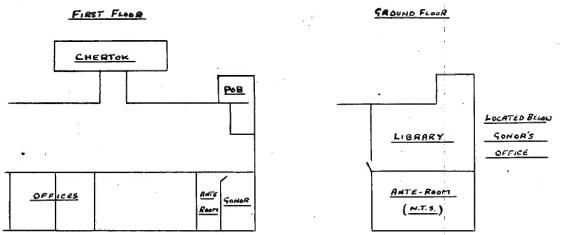


FIG. 7.

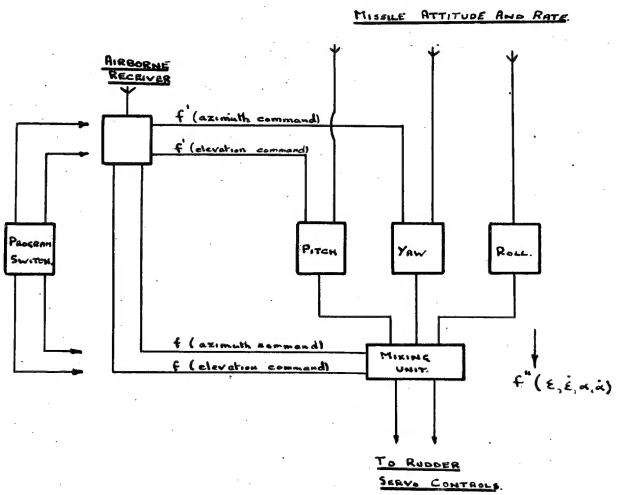


FIG 8

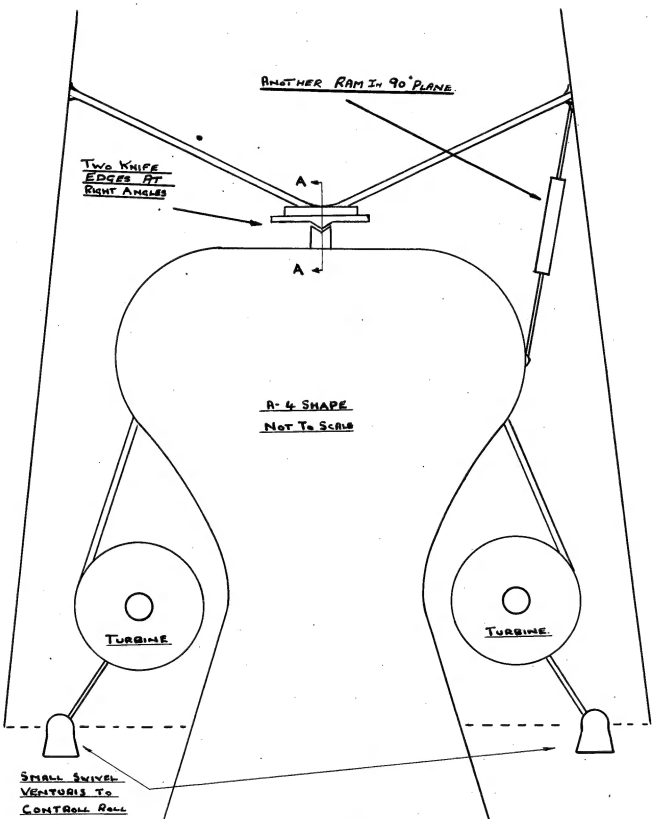


FIG 9

SCRAP VIEW ON A-A